IST EMC LAB.

E M I S S I O N T E S T R E P O R T

Test report file No. : **04-IST-0049** Date of issue : Mar. 20. 2004

Model / Type No. : EFL-1702X ■ Basic ☐ Alternate

Kind of product : LCD Monitor

Brand name : Effinet Systems, INC.

Applicant : Effinet Systems, INC.

Manufacturer : Effinet Systems, INC.

License holder : Effinet Systems, INC.

Address : 6F Moden Venture Town, 1673 Shingil-Dong, Youngdungpo-Ku, Seoul, 150-057, Korea

Test result according to the regulation(s)

■ Positive ☐ Negative

at page 3.

This test report with appendix consists of 30 pages. The test result only responds to the tested sample.
It is not allowed to copy this report even partly without the allowance of the Test Laboratory.
This equipment is complied with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2001.

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TEST REGULATIONS

The tests were performed according to the following regulations ;

■ - FCC Part 15, Subpart B (Unintentional Radiators, Class B)

Information of Test Laboratory

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EQUIPMENT UNDER TEST

Equipment Description :

LCD Pannel :	Type : Samsung LTM170E6 Size : 17" Diagonal
Panel Dimension	383.5(W) x 306.0(H) x 22.8(D) mm
Color Depth	16.7M True color
Contrast Ratio	Typ. 450 : 1
Average Brightness	Typ. 230 cd/ m^2
Number of Pixels	1280 (H) x 1024 (V)
Pixel Pitch	0.264 mm x 0.264 mm
Power Consumpton :	34W Max
Power	100 ~ 240Vac 50/60 Hz 0.7~0.4A

EUT Type :

☒ Table-Top.
☐ Floor-Standing.
☐ Table-Top and Floor-Standing(Combination).

Operation – mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

☐ Standby.
☒ Operational Condition : Scrolling "H" characters under MS Windows, at test mode of 1280 X 1024, 75 Hz

Configuration of the equipment under test :

Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
PC	Vectra VL420MT	HP	SG23101784
Keyboard	SK-2502C	HP	M020321066
PS/2 Mouse	M-S48A	HP	LZC20602926
Serial Mouse	M-S428	Logitech	LCA53305547
Printer	A0302384	Northern Telecom	26633S60168

Connecting Interface Cables :
- Unshielded AC power cable : 1.8 m
- Shielded monitor's signal cable(with two ferrite core) : 1.5 m
- Shielded printer's signal cable (with two ferrite core): 1.8 m

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TEST CONDITIONS

The **measurement of the conducted emissions (Interference voltage)** was performed in the shielded room.

Test location :

☒ Shielded room. No.1 ☐ Compact chamber 2

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESH 3	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	892108/018
3725/2	LISN	EMCO	Jul. 23, 2003	9101-2068
KNW-407	LISN	Hyup-Rip	Jul. 23, 2003	8-883-10
ESH 3-Z2	Pulse Limiter	Rohde & Schwarz	Jul. 23, 2003	357.8810.52

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement Procedures :

Conducted emissions measurments were made in accordance with ANSI C-63.4-2001, "Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to an EMI/Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an IF bandwidth of 10kHz or for "quasi-peak" within a bandwidth of 9kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :

B.S. Shim / Research engineer
IST EMC Lab.

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The **measurement of the radiated emissions (Electric field)** in the frequency range from 30 MHz to 1GHz was performed in horizontal and vertical antenna polarization at a open-site which meet the site attenuation requirement of ANSI C63.4-2001 and a test distance of :

Location : ☐ Open Site No. 1 ☒ Open Site No. 2 ☐ Open Site No. 3
Distance : ☒ 3 meters ☐ 10 meters

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESVP	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	861744/004
VULB 9160	Antenna	Schwarzbeck	Jul. 09, 2003	3048
3115	Horn Antenna	EMCO	Jul. 05, 2003	9012-3602
8566B	Sepectrum Analyzer	Hewlett Packard	Dec.01, 2003	3340A08191
85685A	RF Preselector	Hewlett Packard	Dec.01, 2003	3221A01455
8449B	Preamplifier	Hewlett Packard	Dec.01, 2003	3008A00530

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement procedures

Radiated measurements were in accordance with ANSI C63.4-2001 “Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a EMI/Field Intensity Meter. The measurements were made with the detector set for “quasi-peak” within a bandwidth of 120kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :

B.S. Shim / Research engineer
IST EMC Lab.

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TEST RESULT

Conducted emissions : 150 kHz - 30 MHz

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin

3.3 dB at 0.178 MHz

Remarks : See test-data at pages 12 ~ 14.

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin

3.9 dB at 161.1 MHz

Remarks : See test-data at page 15 ~ 16.

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Measurement Uncertainty Calculation

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

Contribution (Conducted Emissions)	Probability Distribution	Uncertainty (±dB) 0.15-30MHz
Receiver Specification	Rectangular	1.5
LISN Coupling Specification	Rectangular	1.5
Cable and Input Attenuator Calibration	Normal (k=2)	0.5
Mismatch to Reciver	U-Shaped	-0.8 / +0.7
System Repeatability	Normal (k=1)	0.2
Combined Standard Uncertainty	Normal (k=2)	-1.85 / +1.71
Expanded Uncertainty U	Normal (k=2)	-3.7 / +3.42

$U_{c,\min us}$ = -1.85, $U_{c,plus}$ = 1.71

U = -3.70 / +3.42 (k=2, 95.45% confidence level)

Contribution (Radiated Emissions)	Probability Distribution	Uncertainties(±dB) 3 m
Antenna		
Factor	Normal (k=2)	0.9968
Frequency Interpolation	Rectangular	0.1039
Height Variation	Rectangular	-2.6 / +1.5
Directivity Difference	Rectangular	-1.0 / +0
Phase Center Location	Rectangular	1.0
Cable Loss	Normal (k=2)	0.5
Receiver		
Voltage Accuracy	Normal (k=2)	2.0
Pulse Response	Rectangular	1.5
Absolute Repetition Rate	Rectangular	1.5
Mismatch to Receiver $\lvert \Gamma_{antenna} \rvert = 0.33$ $\lvert \Gamma_{receiver} \rvert = 0.33$	U-Shaped	-1.0 / +0.9
System Repeatibility	Std Deviation	0.5
Combined Standard Uncertainty	Normal	-2.6048 / 2.2775
Expanded Uncertainty U	Normal (k=2)	-5.21 / +4.55

$U_{c,\min us}$ = -2.6048, $U_{c,plus}$ = 2.2775

U = -5.21 / +4.55 (k=2, 95.45% confidence level)

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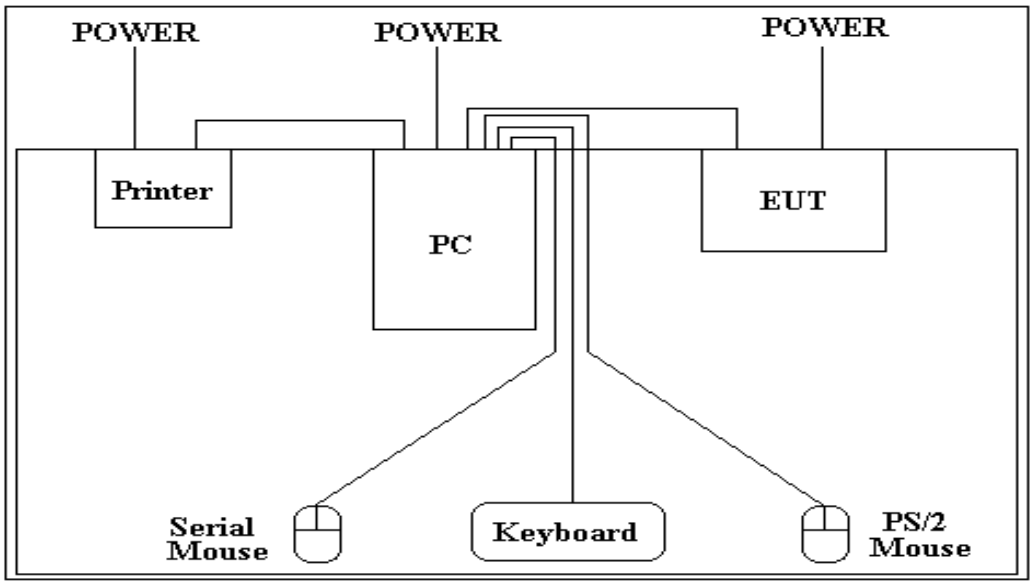
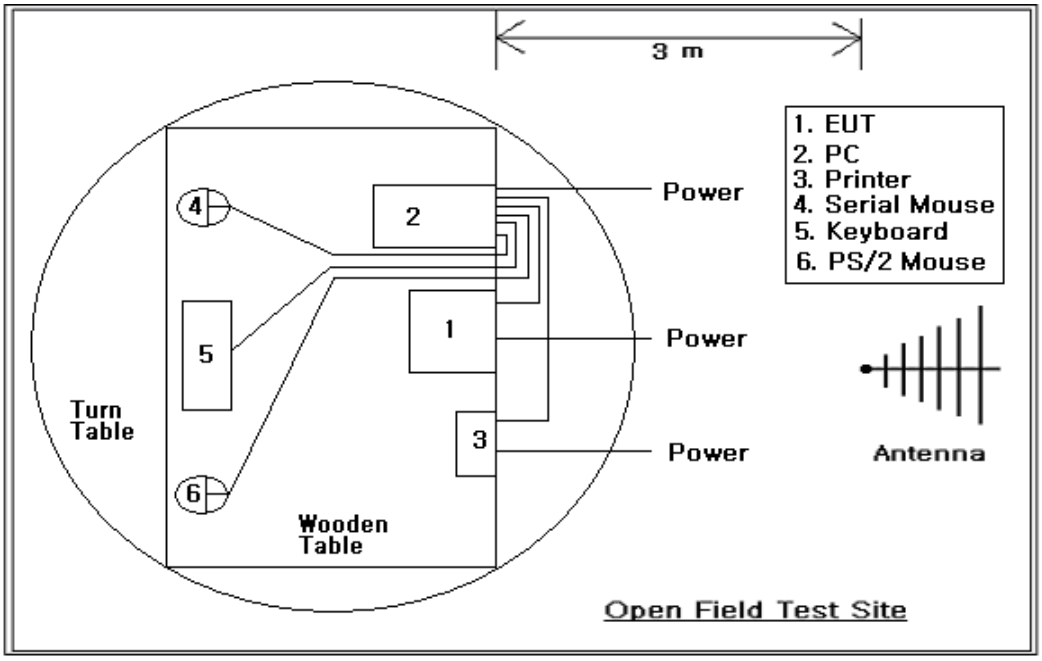
TEST SETUP (Drawings)

Type :EFL-1702X



Conducted Emissions 150kHz - 30 MHz



Radiated Emissions 30 MHz - 1000 MHz

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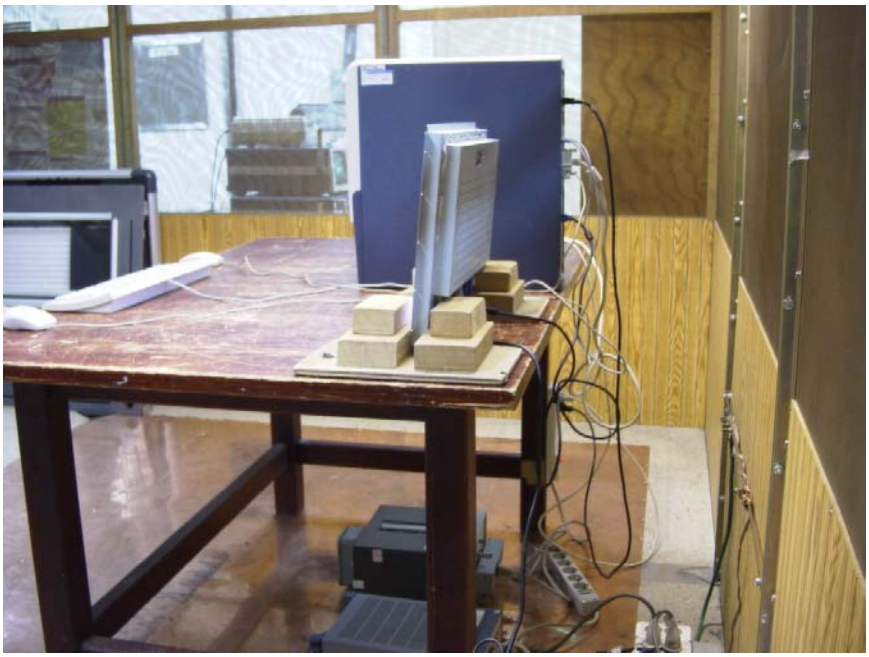
TEST SETUP (Photos)

Type : EFL-1702X

Conducted Emissions 150kHz - 30 MHz



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TEST SETUP (Photos)

Type : EFL-1702X

Radiated Emissions 30MHz - 1000 MHz

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Conducted Emission Test Data

Type	EFL-1702X		
Manufacturer	Effinet Systems.,INC.		
Operation mode	Scrolling "H" pattern display at 1280 x 1024, 75Hz		
Environmental Conditon	Temperature	:	19 °C
	Humidity	:	48 %
	Atmospheric pressure	:	1013mbar
Date	Mar. 10, 2004		

Highest Emissions ralative to the limit

Frequency [MHz]	Reading [dBμV]		Phase	Insertion Loss (LISN)	Limit [dBμV]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.178	60.5	45.1	L1	0.8	64.6	54.6	3.3	8.7
0.221	51.9	39.5		0.8	62.8	52.8	10.1	12.5
0.709	36.0	31.8		0.8	56.0	46.0	19.2	13.4
4.743	36.1	33.3		0.8	56.0	46.0	19.1	11.9
17.498	43.4	35.0		0.8	60.0	50.0	15.8	14.2
21.168	44.3	34.5		0.8	60.0	50.0	14.9	14.7
0.175	59.6	42.9	N	0.8	64.7	54.7	4.3	11.0
0.221	51.7	37.5		0.8	62.8	52.8	10.3	14.5
1.326	30.0	23.8		0.8	56.0	46.0	25.2	21.4
4.813	33.4	30.5		0.8	56.0	46.0	21.8	14.7
18.637	43.5	34.8		0.8	60.0	50.0	8.7	12.7
21.197	44.7	34.5		0.8	60.0	50.0	5.7	15.4
Cable loss are less than 0.1 dB								

*L1 : Live Line
**N : Neutral Line
*** **Please refer to data graphs at page 13 ~ 14.**

This is the worst data among three resolutions. (800*600,75Hz ; 1024*768, 75Hz ; 1280*1024,75Hz)
Please refer to the data at page 19 ~ 27

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]

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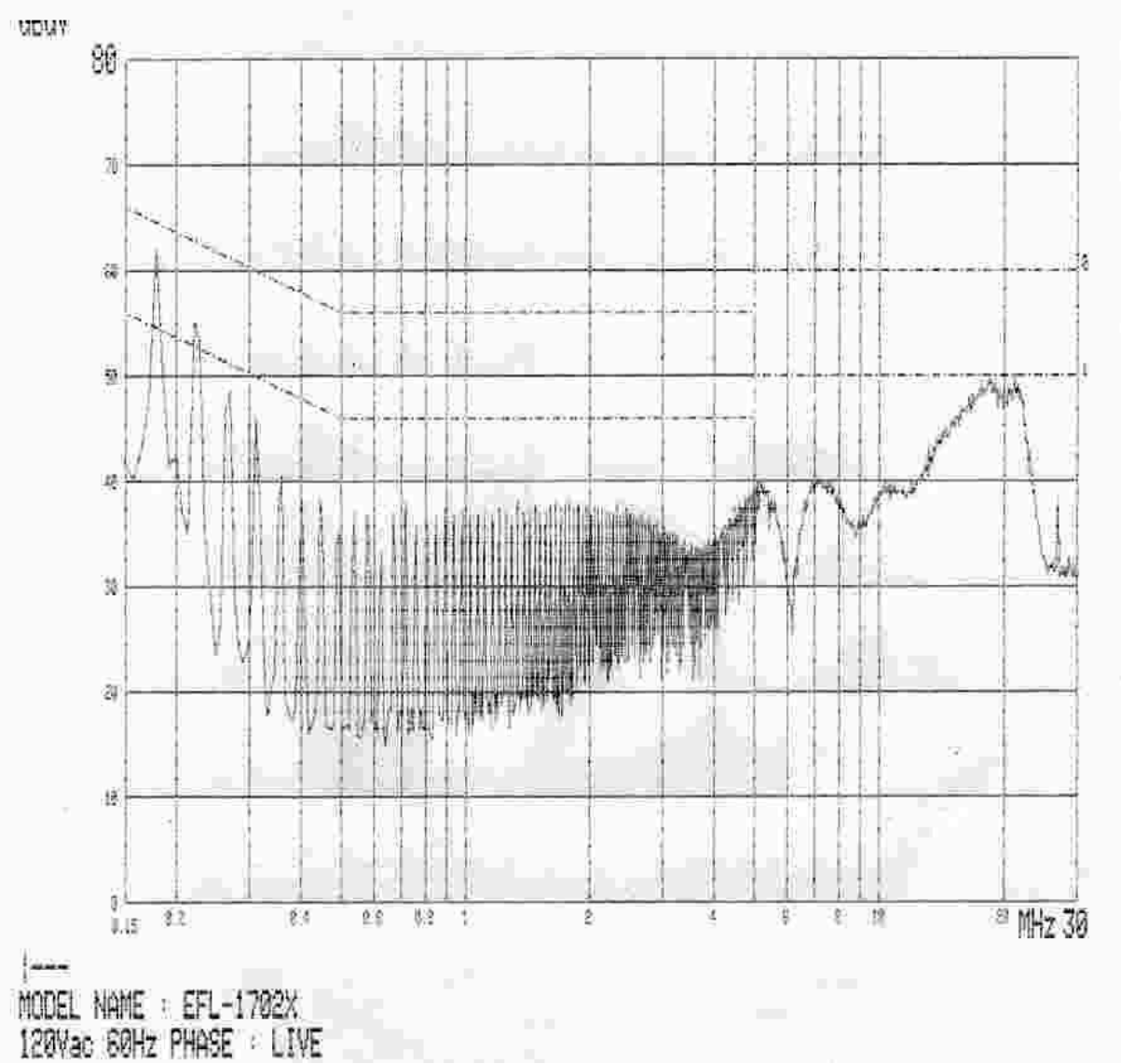

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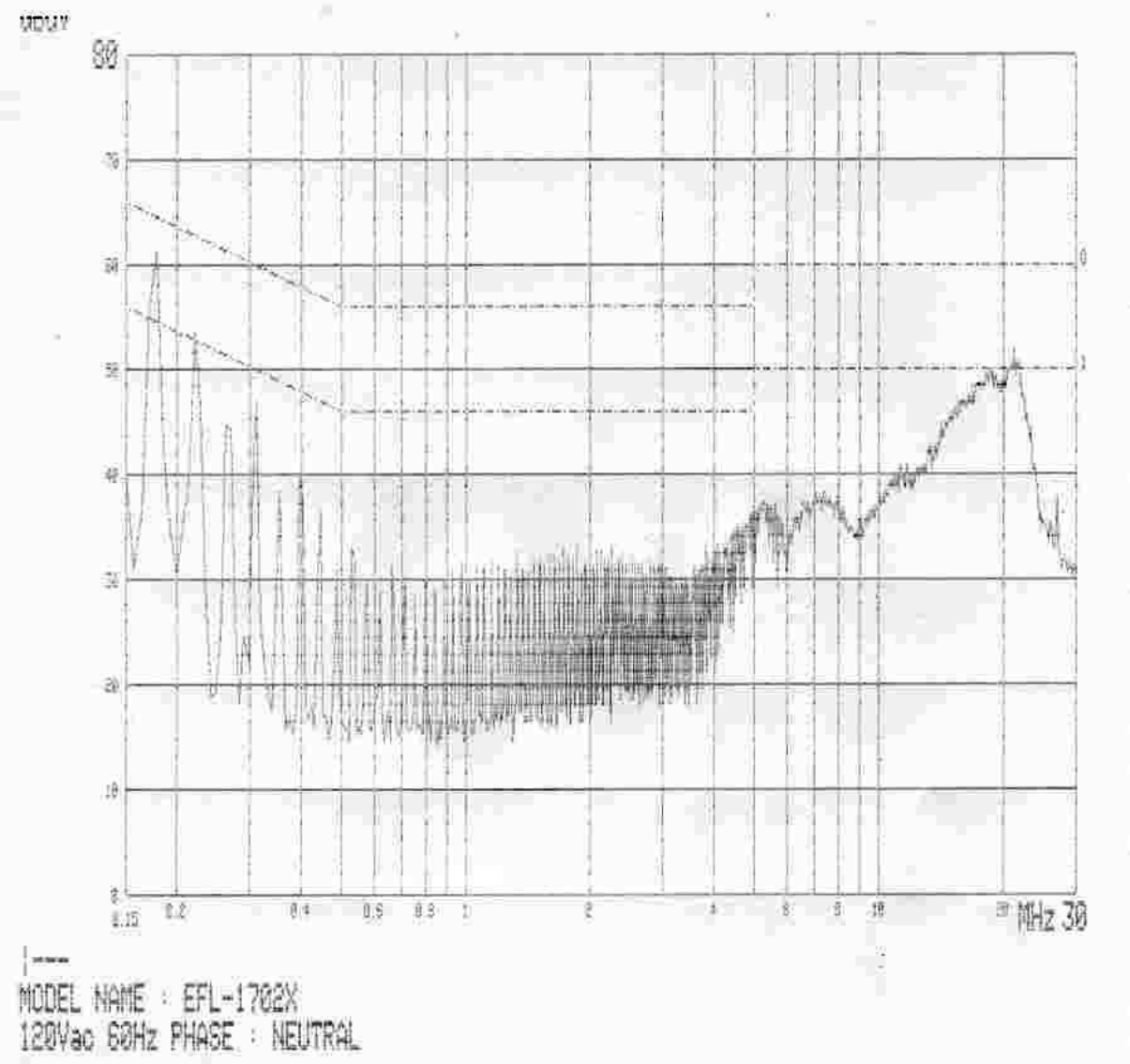

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Radiation Test Data

Type	EFL-1702X
Manufacturer	Effinet Systems., INC.
Operation mode	Scrolling "H" pattern display at 1280 x 1024, 75Hz
Environmental Conditon	Temperature : 11 °C
	Humidity : 48 %
	Atmospheric pressure : 1014 mbar
Test distance	3 m
Antenna	VULB9160 (under 1 GHz), EMCO3115 (over 1 GHz)
Date	Mar. 10, 2004

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Preamp Gain [dB]	Angle [deg]	Height [cm]	Polar [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
40.5	14.0	11.5	1.3	-	324	400	H	26.8	40.0	-13.2
108.5	16.6	10.1	2.3	-	180	100	V	29.0	43.5	-14.5
128.8	16.2	12.0	2.7	-	180	100	V	30.9	43.5	-12.6
139.6	16.0	12.7	2.8	-	138	106	V	31.5	43.5	-12.0
161.1	23.6	13.1	2.9	-	121	100	V	39.6	43.5	-3.9
182.6	16.5	10.8	3.2	-	212	100	V	30.5	43.5	-13.0
191.7	14.6	10.0	3.3	-	0	100	V	27.9	43.5	-15.6
206.7	19.1	9.2	3.3	-	360	100	V	31.6	43.5	-11.9
214.7	23.8	9.3	3.4	-	374	152	H	36.5	43.5	-7.0
247.0	15.3	10.9	3.9	-	288	100	H	30.1	46.0	-15.9
257.7	14.3	11.2	3.9	-	283	100	V	29.4	46.0	-16.6
268.5	17.3	11.5	3.9	-	296	138	V	32.7	46.0	-13.3
322.1	15.6	13.1	4.5	-	350	100	H	33.2	46.0	-12.8
375.8	19.5	14.2	5.1	-	328	100	V	38.8	46.0	-7.2
429.5	20.0	15.4	5.4	-	300	100	V	40.8	46.0	-5.2
451.0	15.0	16.1	5.6	-	332	121	V	36.7	46.0	-9.3
461.7	13.6	16.3	5.7	-	67	161	V	35.6	46.0	-10.4
1,055	54.9	23.1	3.2	31.1	-	-	-	50.1	54.0	-3.9
1,108	56.2	23.1	3.3	31.1	-	-	-	51.5	54.0	-2.5
1,478	52.7	24.6	4.0	30.9	-	-	-	50.4	54.0	-3.6
1,529	52.6	24.9	4.2	30.8	-	-	-	50.9	54.0	-3.1
1,794	51.1	25.8	5.0	31.2	-	-	-	50.7	54.0	-3.3
1,898	48.5	26.3	5.6	31.3	-	-	-	49.1	54.0	-4.9

Above 1 GHz, peak detector function mode was used with the preamplifier. The result value above 1 GHz was summed to the corrective factor. Please refer to the description of page 17.

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%, Uncertainty U = -5.21 / +4.55 [dB]

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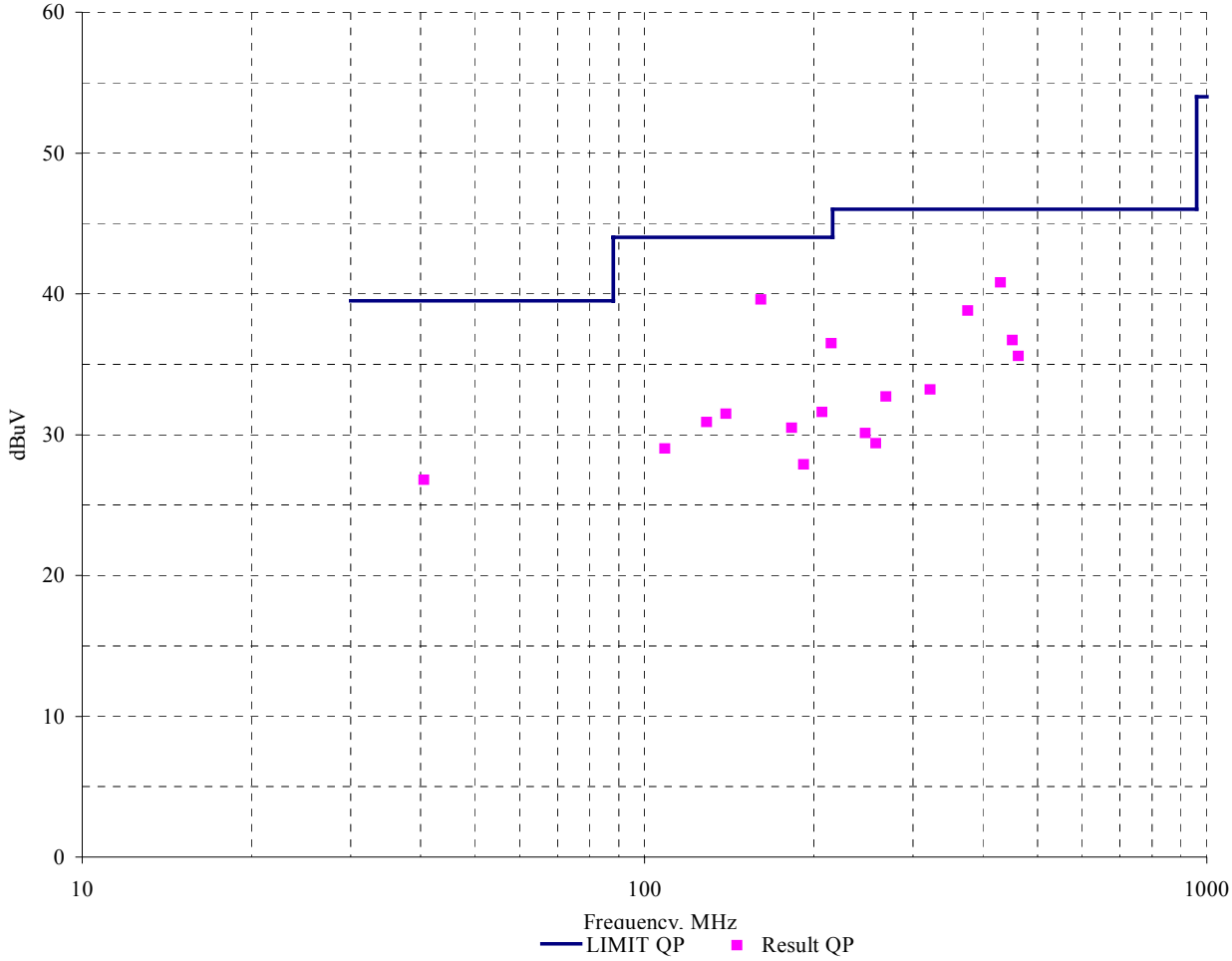
MEASUREMENT OF DISTURBANCE RADIATION



This is the worst data among three resolutions. (800*600,75Hz ; 1024*768, 75Hz ; 1280*1024,75Hz)
Please refer to the data at page 28 ~ 30.

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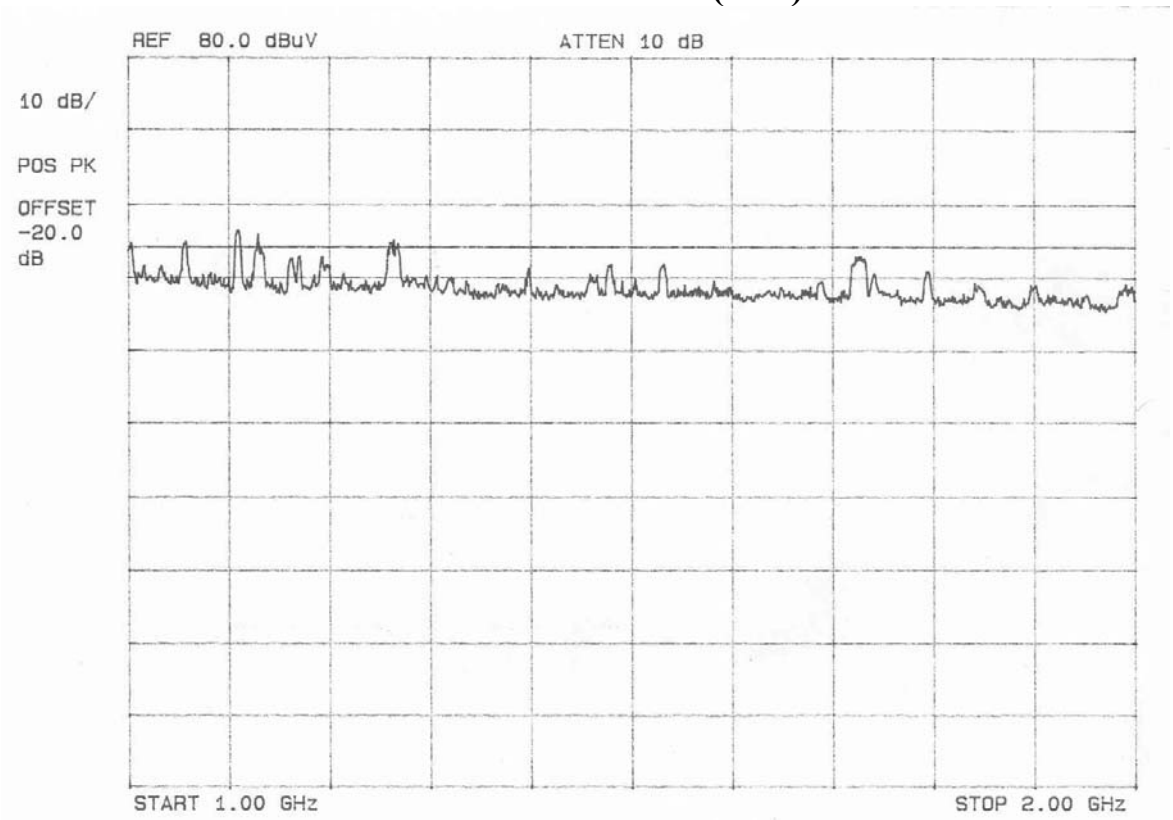
Radiation Test Data (Plot)



[Measured Data from 1 GHz to 2 GHz]

Measured Data from 1GHz to 2GHz

Above 1 GHz, peak detector function mode was used with the preamplifier. The following graphs show that all data of full frequencies met the limit.

The spectrum plot was obtained with peak detect mode and maximum hold mode. It was used for plot the HP8566B spectrum analyzer, EMCO 3115 Horn antenna and HP85685A RF preselector.
(Section 15.35)
For example, the peak value evaluation at the frequency of 1.055 GHz is
54.9 dB(measured) + 23.1 dB(antenna factor) + 3.2 dB(cable loss)
– 31.1 dB = 50.1 dB (less than average limit 54.0 dB)

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SUMMARY

GENERAL REMARKS :

The equipment is not modified anything, mechanical or circuit to improve EMI characteristics during the measurement.

FINAL JUDGMENT :

The requirements according to the technical regulations are

☒ Kept ☐ Not kept

The equipment under test does

☒ Fulfill the general approval requirements mentioned on page 3.
☐ Not fulfill the general approval requirements mentioned on page 3.

Begin of testing : Mar. 10, 2004

End of testing : Mar. 18, 2004

Reviewed by :	Approved by :
Joon H. Lee. EMC Manager IST EMC Lab.	G. Chung Chief of EMC Lab.

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Appendix : Test Data at multiple resolutions

Appendix A : Conducted emission

Type	EFL-1702X	
Manufacturer	Effinet Systems.,INC.	
Operation mode	Scrolling "H" pattern display at 800 x 600, 75Hz	
Environmental Conditon	Temperature	: 19 °C
	Humidity	: 48 %
	Atmospheric pressure	: 1014mbar
Date	Mar 17, 2004	

Highest Emissions ralative to the limit

Frequency [MHz]	Reading [dBμV]		Phase	Insertion Loss (LISN)	Limit [dBμV]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.177	58.8	41.4	L1	0.8	64.6	54.6	5.0	12.4
0.220	51.7	38.1		0.8	62.8	52.8	10.3	13.9
1.766	35.2	29.2		0.8	56.0	46.0	20.0	16.0
4.859	36.5	31.0		0.8	56.0	46.0	18.7	14.2
17.853	42.9	34.0		0.8	60.0	50.0	16.3	15.2
21.201	42.6	31.8		0.8	60.0	50.0	16.6	17.4
0.175	58.2	38.6	N	0.8	64.7	54.7	5.7	15.3
0.221	52.0	36.2		0.8	62.8	52.8	10.0	15.8
2.112	31.0	23.1		0.8	56.0	46.0	24.2	22.1
4.844	33.6	29.3		0.8	56.0	46.0	21.6	15.9
17.978	41.8	32.6		0.8	60.0	50.0	17.4	16.6
20.606	42.1	31.5		0.8	60.0	50.0	17.1	17.7
Cable loss are less than 0.1 dB								

*L1 : Live Line
**N : Neutral Line
*** **Please refer to data graphs at page 20 ~ 21.**

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]

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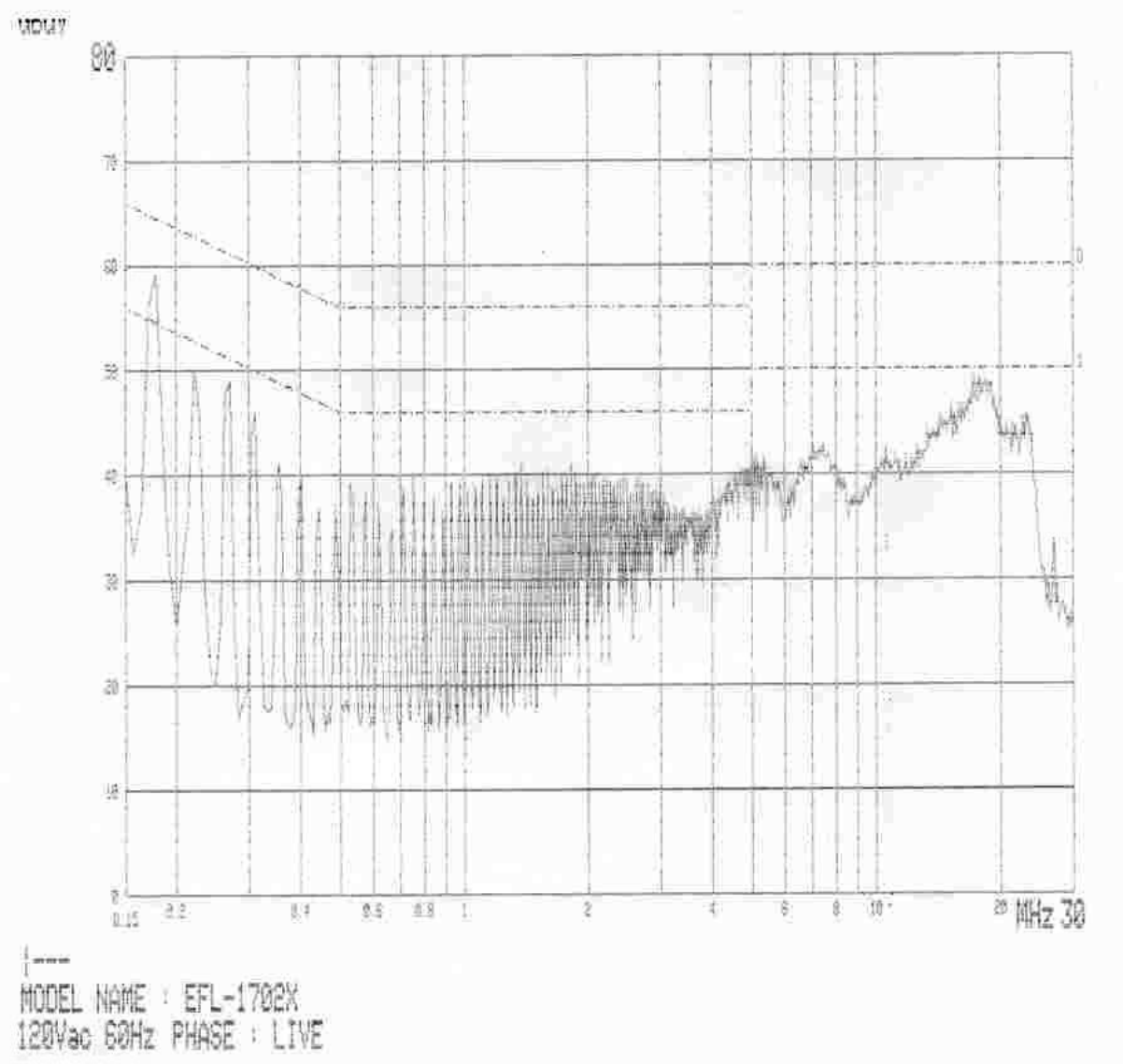

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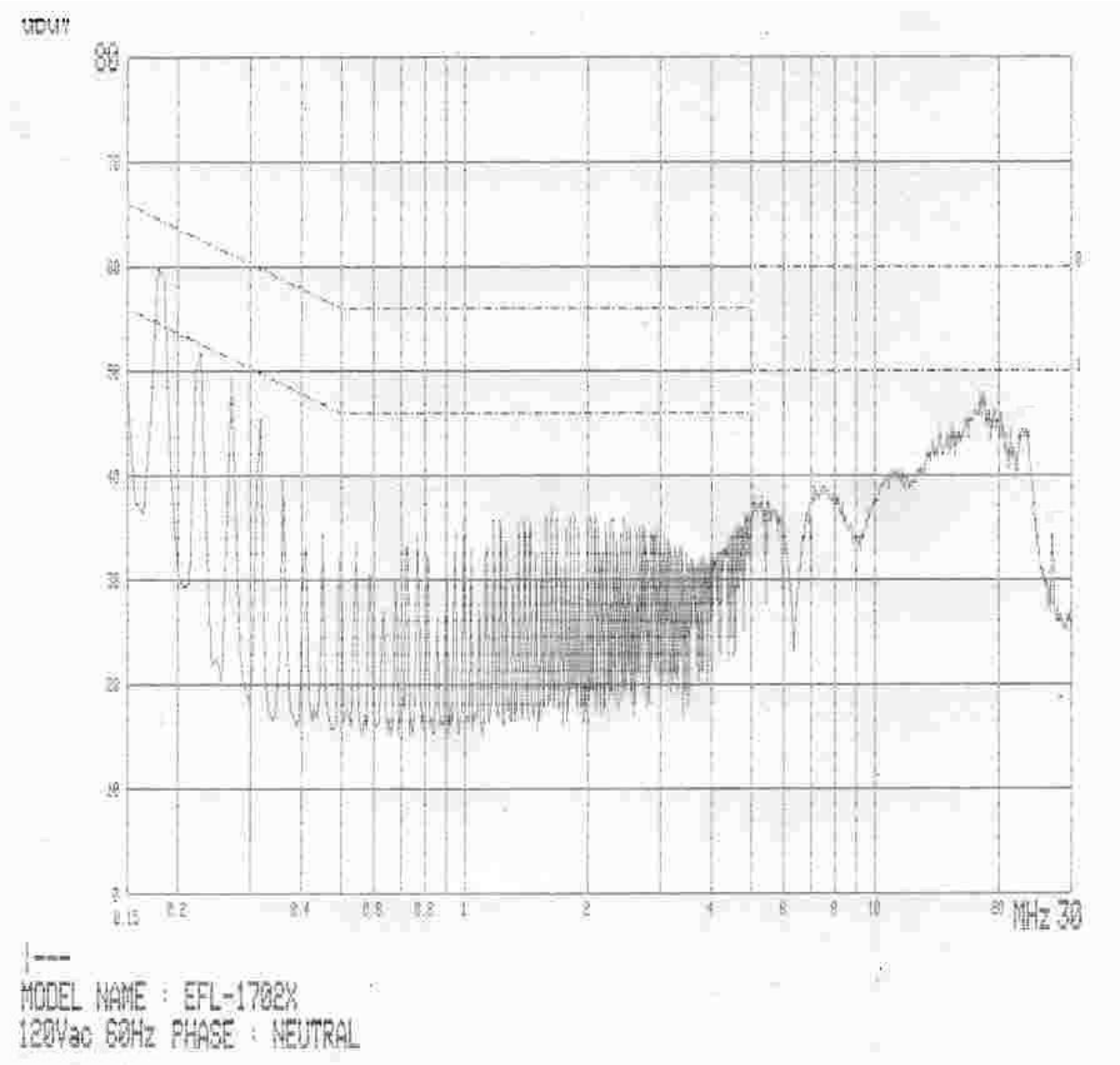

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Appendix A : Conducted emission

Type	EFL-1702X		
Manufacturer	Effinet Systems.,INC.		
Operation mode	Scrolling "H" pattern display at 1024 x 768, 75Hz		
Environmental Conditon	Temperature	:	19 °C
	Humidity	:	48 %
	Atmospheric pressure	:	1014mbar
Date	Mar. 17, 2004		

Highest Emissions ralative to the limit

Frequency [MHz]	Reading [dBμV]		Phase	Insertion Loss (LISN)	Limit [dBμV]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.178	58.6	42.3	L1	0.8	64.6	54.6	5.2	11.5
0.222	51.9	39.0		0.8	62.7	52.7	10.0	12.9
1.767	36.7	29.8		0.8	56.0	46.0	18.5	15.4
4.860	37.1	32.0		0.8	56.0	46.0	18.1	13.2
17.873	43.2	34.6		0.8	60.0	50.0	16.0	14.6
21.401	43.5	32.4		0.8	60.0	50.0	15.7	16.8
0.178	58.4	40.2	N	0.8	64.6	54.6	5.4	13.6
0.225	52.6	37.8		0.8	62.6	52.6	9.2	14.0
2.122	32.4	24.5		0.8	56.0	46.0	22.8	20.7
4.859	34.1	30.2		0.8	56.0	46.0	21.1	15.0
17.979	42.0	32.4		0.8	60.0	50.0	17.2	16.8
22.725	42.0	29.8		0.8	60.0	50.0	17.2	19.4
Cable loss are less than 0.1 dB								

*L1 : Live Line
**N : Neutral Line
*** **Please refer to data graphs at page 23 ~ 24.**

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]

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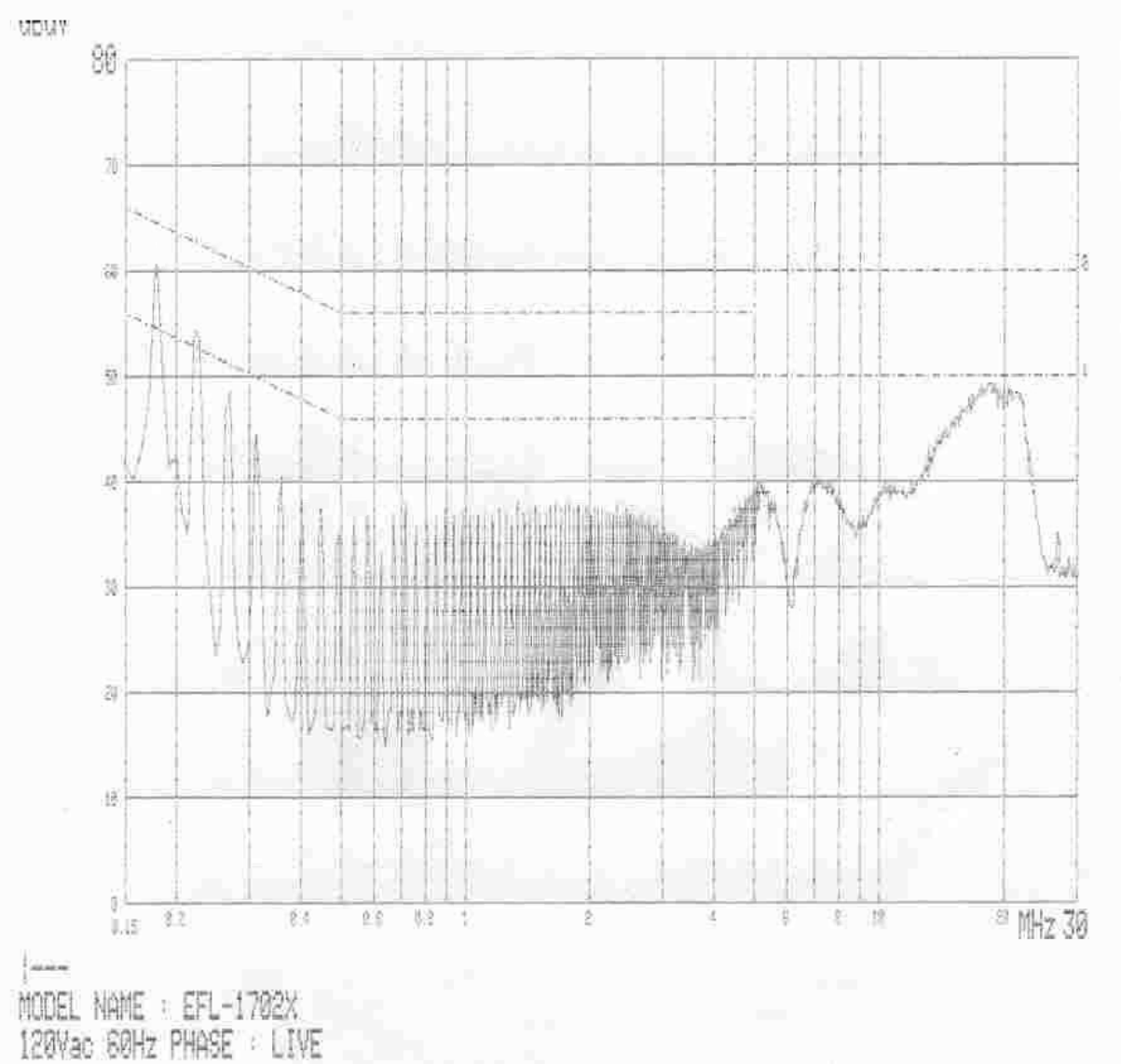
Domestic - Tel : 031 - 333 - 4093. Fax : 031 - 333 - 4094.



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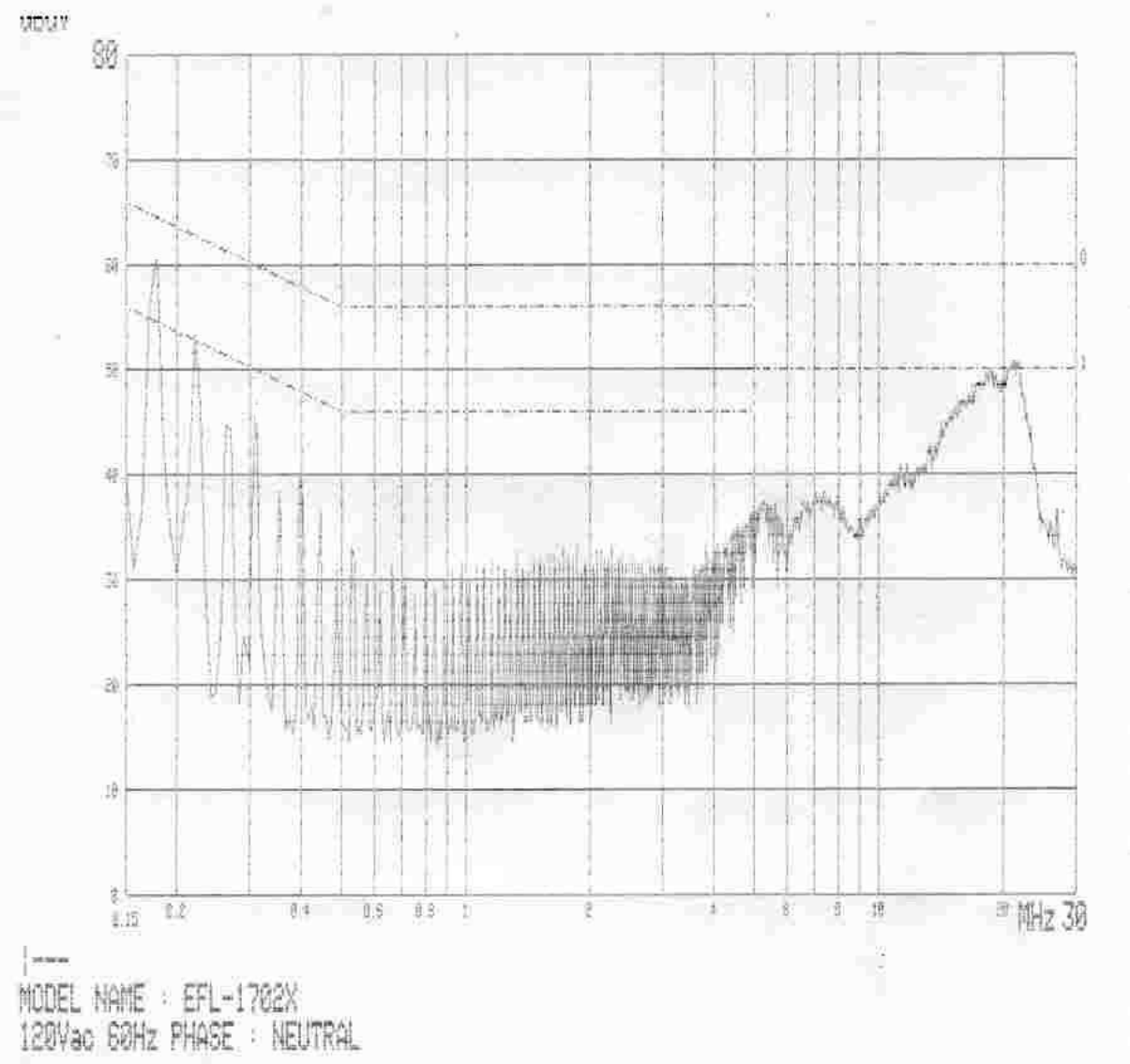
International - Tel : 82-31 - 333 - 4093. Fax : 82-31 - 333 - 4094.
Domestic - Tel : 031 - 333 - 4093. Fax : 031 - 333 - 4094.



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Domestic - Tel : 031 - 333 - 4093. Fax : 031 - 333 - 4094.

Appendix A : Conducted emission

Type	EFL-1702X		
Manufacturer	Effinet Systems.,INC.		
Operation mode	Scrolling "H" pattern display at 1280 x 1024, 75Hz		
Environmental Conditon	Temperature	:	19 °C
	Humidity	:	48 %
	Atmospheric pressure	:	1014mbar
Date	Mar. 17, 2004		

Highest Emissions ralative to the limit

Frequency [MHz]	Reading [dBμV]		Phase	Insertion Loss (LISN)	Limit [dBμV]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.178	60.5	45.1	L1	0.8	64.6	54.6	3.3	8.7
0.221	51.9	39.5		0.8	62.8	52.8	10.1	12.5
0.709	36.0	31.8		0.8	56.0	46.0	19.2	13.4
4.743	36.1	33.3		0.8	56.0	46.0	19.1	11.9
17.498	43.4	35.0		0.8	60.0	50.0	15.8	14.2
21.168	44.3	34.5		0.8	60.0	50.0	14.9	14.7
0.175	59.6	42.9	N	0.8	64.7	54.7	4.3	11.0
0.221	51.7	37.5		0.8	62.8	52.8	10.3	14.5
1.326	30.0	23.8		0.8	56.0	46.0	25.2	21.4
4.813	33.4	30.5		0.8	56.0	46.0	21.8	14.7
18.637	43.5	34.8		0.8	60.0	50.0	8.7	12.7
21.197	44.7	34.5		0.8	60.0	50.0	5.7	15.4
Cable loss are less than 0.1 dB								

*L1 : Live Line
**N : Neutral Line
*** **Please refer to data graphs at page 26 ~ 27.**

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]

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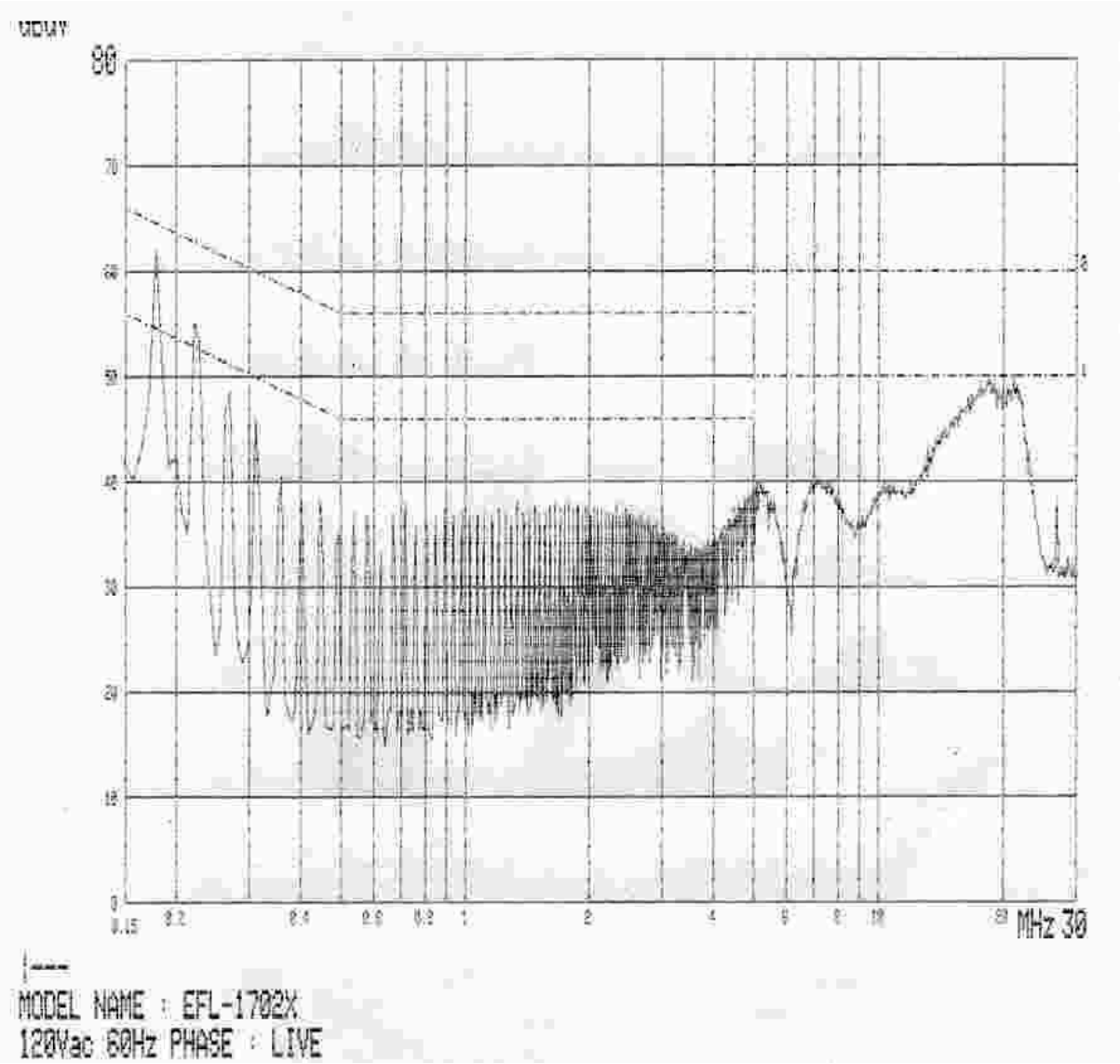

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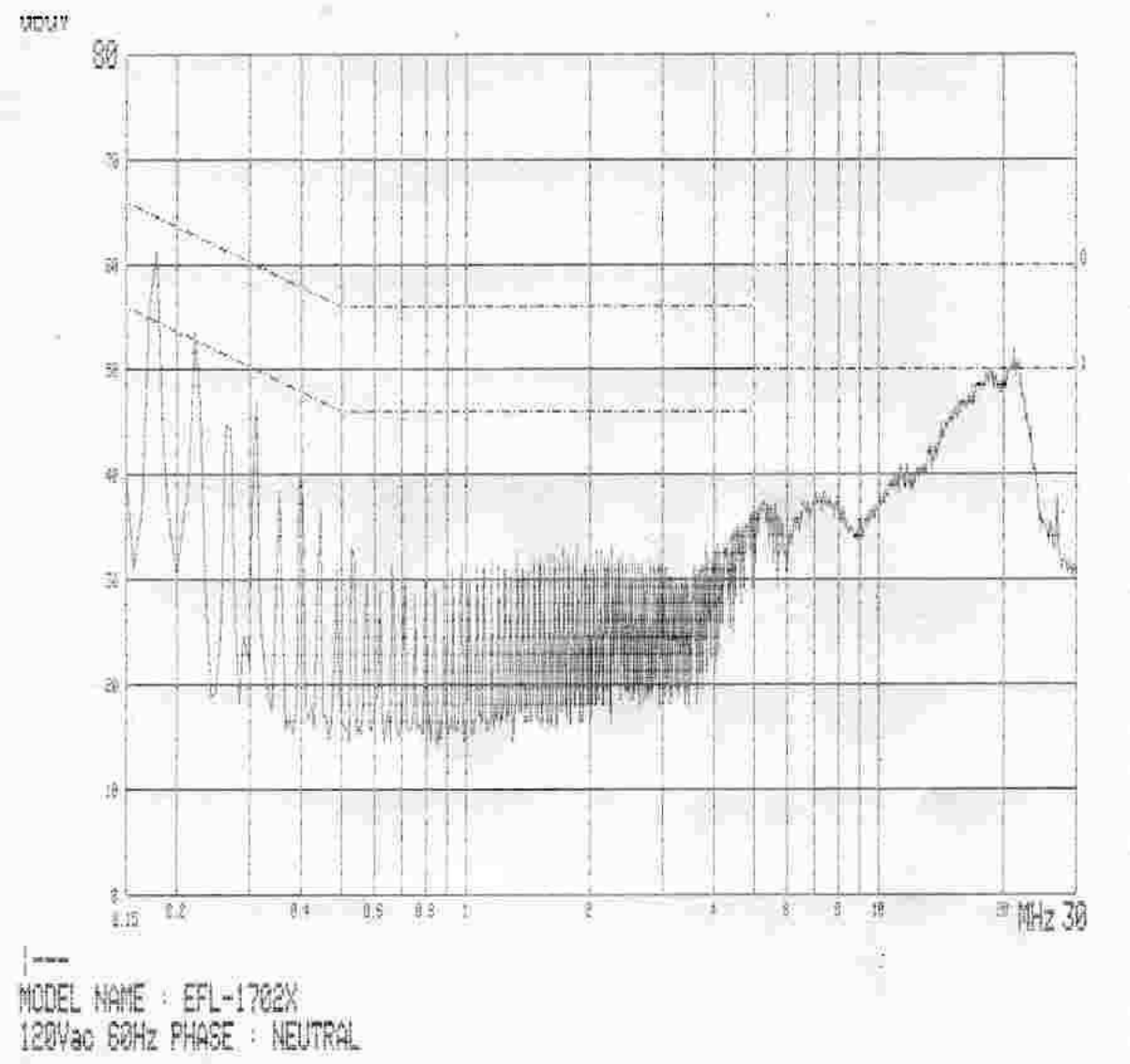

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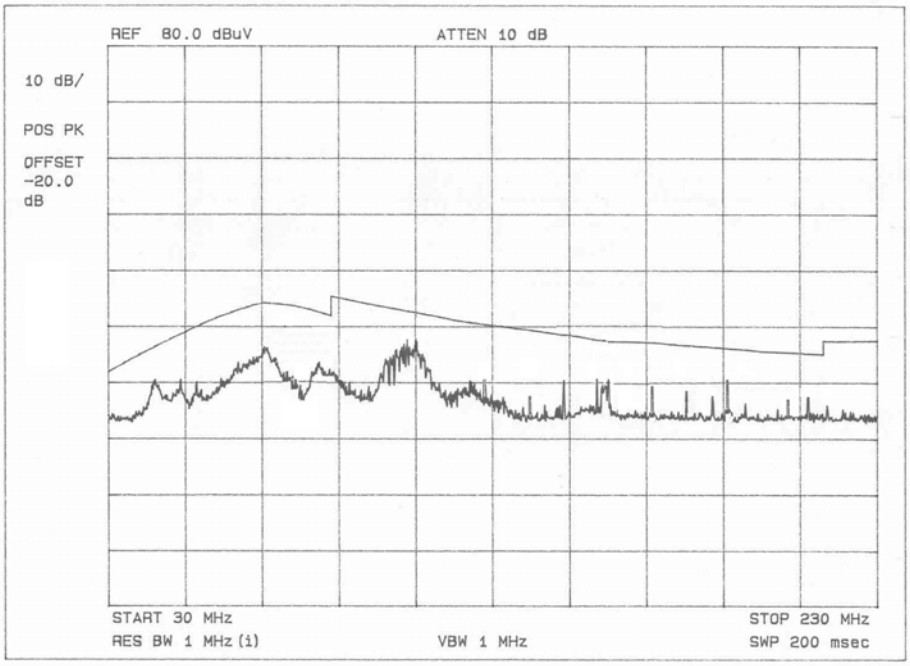
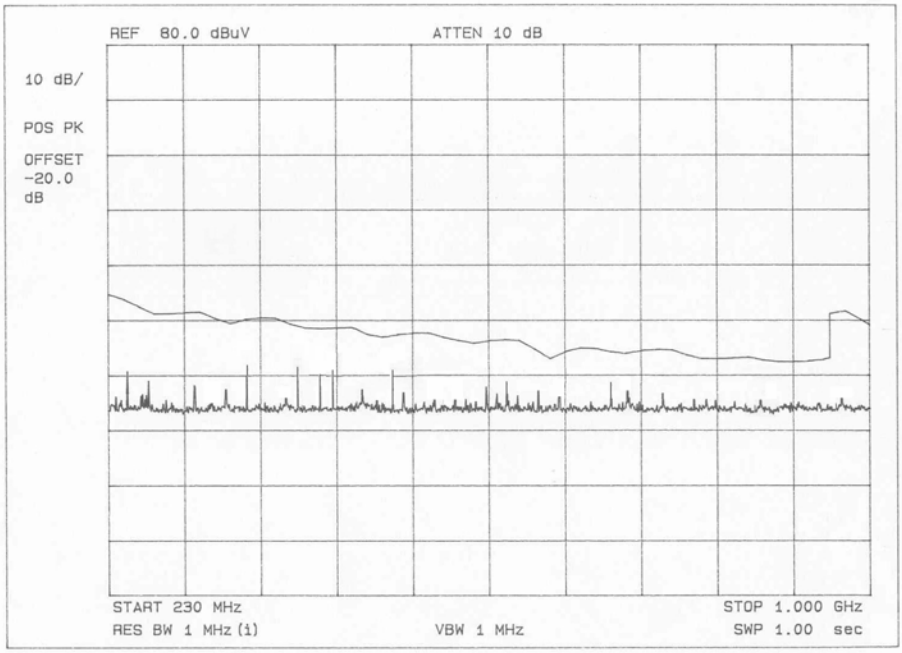
Appendix B : Radiated emission

Resolution : 800*600,75Hz





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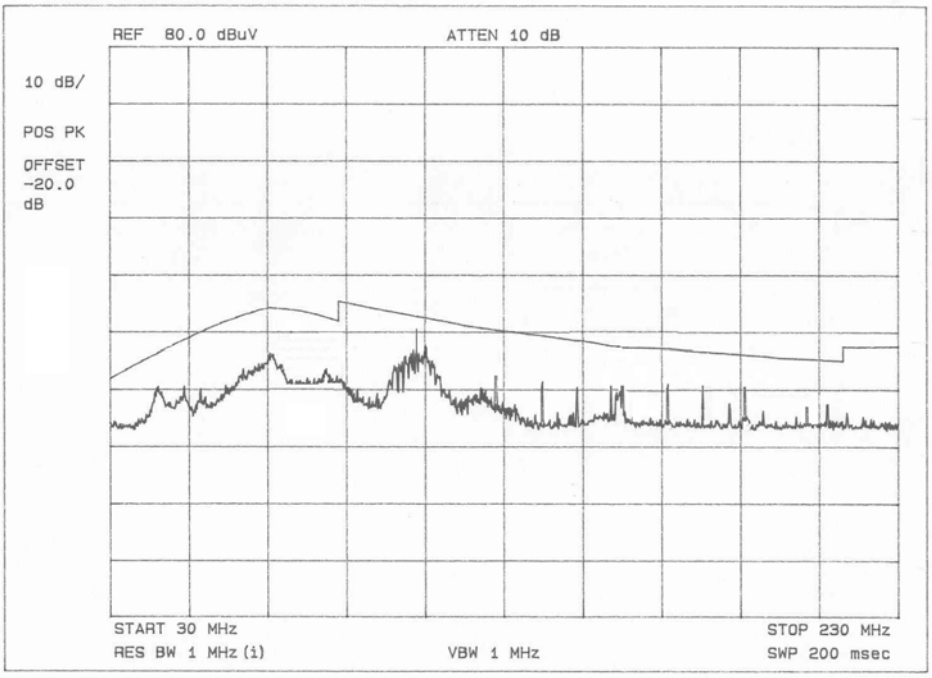
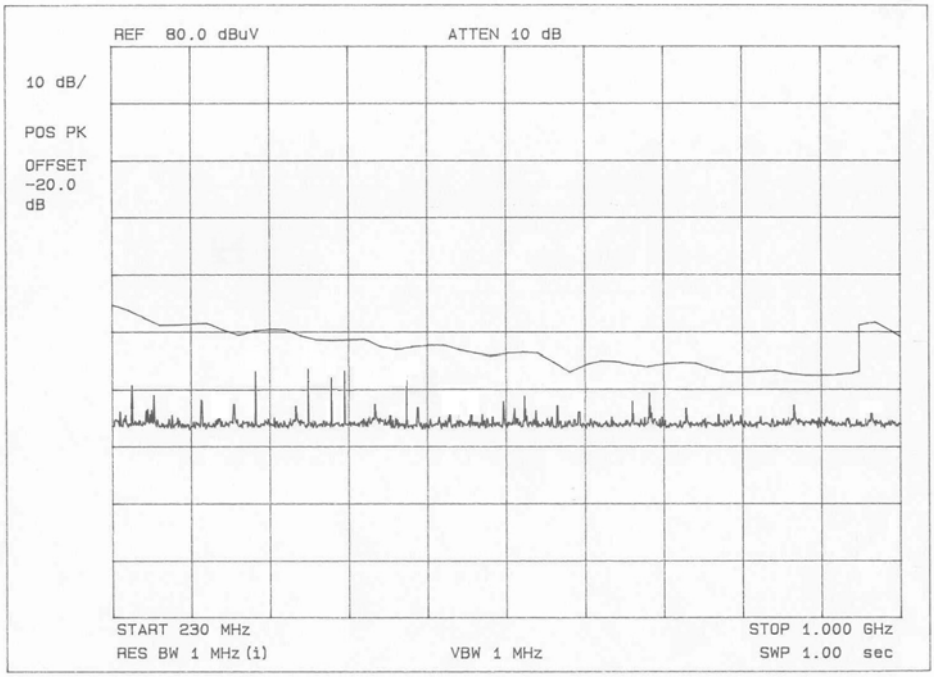
Domestic - Tel : 031 - 333 - 4093. Fax : 031 - 333 - 4094.

Radiation Test Data

Resolution : 1024*768,75Hz





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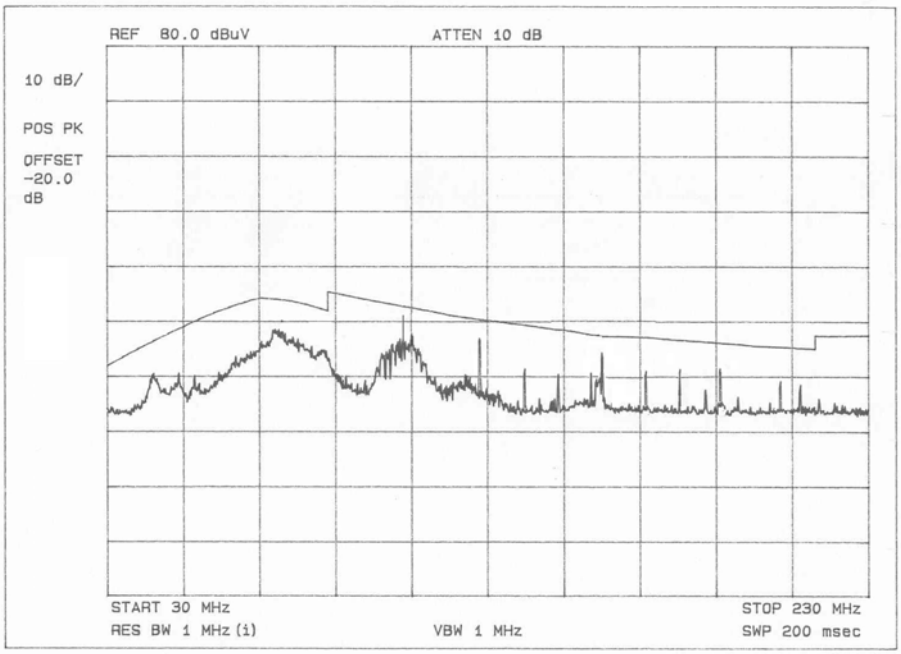
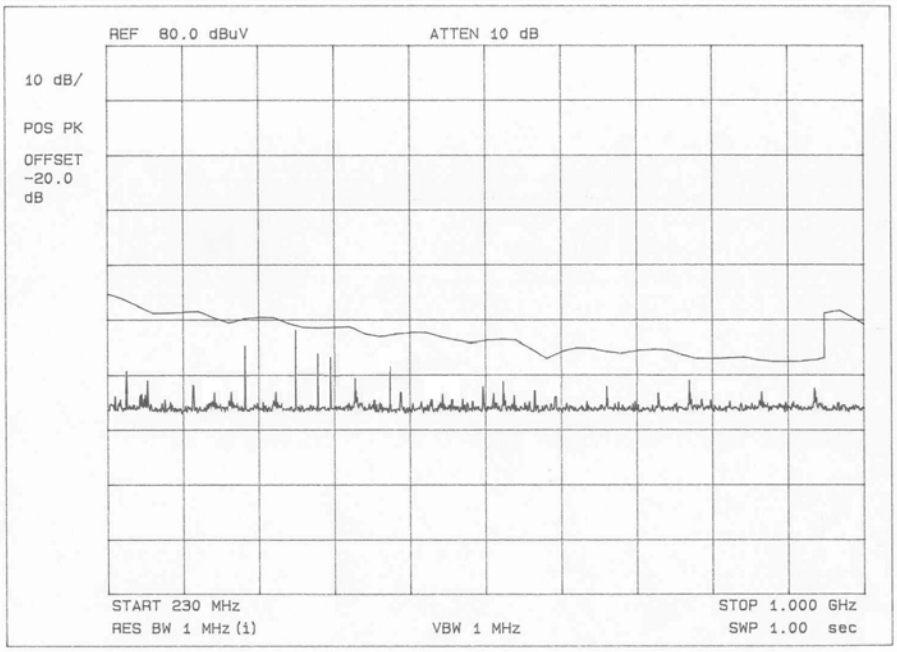
Radiation Test Data

Resolution : 1280*1024,75Hz





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